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# Forward Looking Statements

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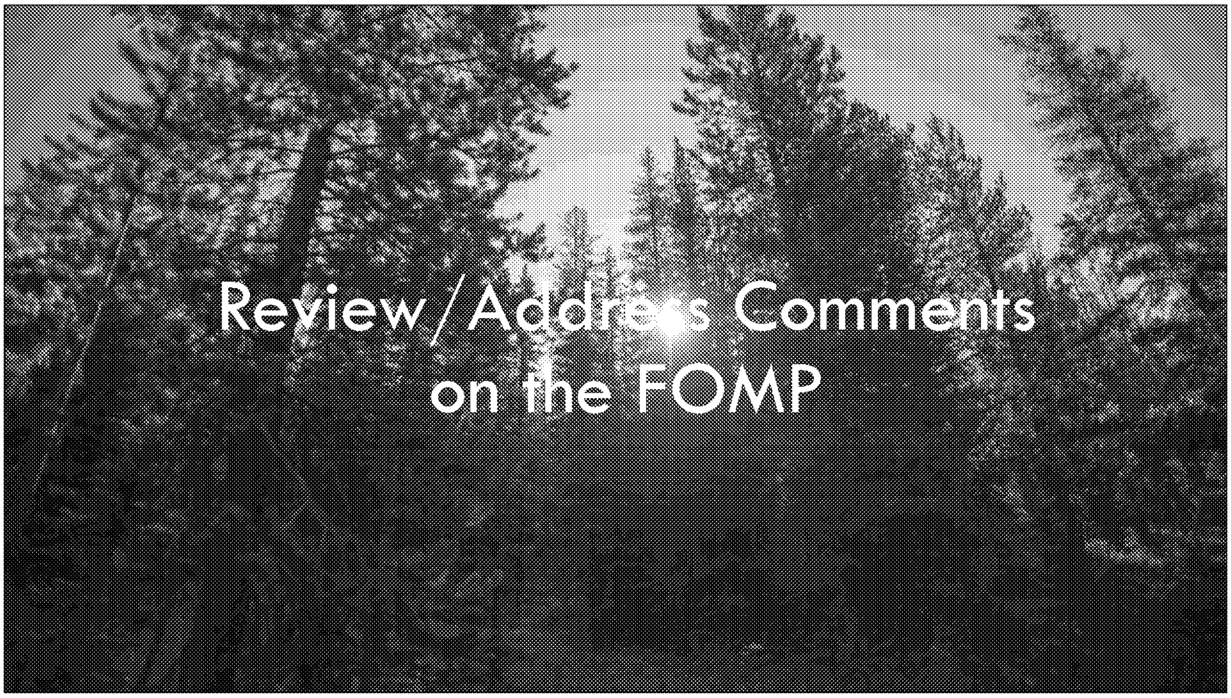
# Agenda

1. Review/Address Comments on the FOMP (60 min)
2. Discuss Meadow Creek Diversion Options (30 min)
3. Downstream Effects of High Flow Diversions for Hangar Flat Pit Refill (60 min)
4. Fish Salvage Sequencing Example: Meadow Creek Salvage at the TSF Area (30 min)
5. Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels (60 min)
6. Fish Periodicity Continued Discussion (30 min)
7. Updated Biological Assessment Schedule (30 min)
8. Future Meeting Objectives and Draft Agenda (15 min)
9. Past and New Action Item Review (15 min)

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# Review/Address Comments on the FOMP

*Intent: To review and discuss USFWS and NOAA comments on the FOMP and how they will be addressed in the informal consultation process and revised FOMP.*

# Review/Address Comments on the FOMP

- **Plan to Respond to Comments on FOMP**
  - Discuss 6 top issues in today's meeting and get your feedback and clarifications
  - Develop an Addendum to the Fishway Design Document that clarifies Trap and Haul design elements and other comments
  - Update the FOMP to address comments
  - To the degree possible reflecting the current level of fishway design and operational plans

# Review/Address Comments on the FOMP

| FOMP COMMENT TOPICS |
| --- |
| Trap and haul design, equipment, and procedures (design and FOMP) |
| Rock weir design and protocols to maintain pool elevation in the adult holding pool and fishway entrance (design and FOMP) |
| Management of streamflow during watering and dewatering of tunnel/fishway (FOMP and Diversions and Dewatering and Fish Salvage Plan) |
| Monitoring and maintaining tunnel elements – methods, protocols, timing (FOMP with design input) |
| Management of sediment and accumulation in fishway (design and FOMP) |
| Frequency of tunnel portal inspection (design and FOMP) |
| Project-specific work window (FOMP and Fish Salvage and Relocation Plan) |

# Review/Address Comments on the FOMP

**I. Trap and haul design, equipment, and procedures**
**(Design and FOMP)**

| Comment | Response |
|---|---|
| **Section 3.11; Page 3-5**<br><br>Please include more specific information about trap and haul practices that will be implemented. The type of information we will need includes, but is not limited to, a description of:<br><br>(1) Protocol for how fish will be collected;<br>(2) how long they will be held;<br>(3) what they will be held in;<br>(4) where holding water will be obtained from;<br>(5) Protocol for fish stress and health monitoring;<br>(6) what metrics for fish stress and health will be monitored and how (e.g., dissolved oxygen, temperature, etc.);<br>(7) where they will be out-planted; and<br>(8) how they will be out-planted.<br><br>Please also include details pertaining to the monitoring and reporting of fish stress, fish health, and mortality. | **Provide additional information on trap and haul procedures and monitoring in the areas identified**<br>Fish collection, handling, and Holding period<br>Holding and transport containers<br>Provide fish stress and health monitoring and metrics<br>Include assessment of environmental conditions, fish health, and reporting<br>Include potential release locations and release techniques<br><br>**Develop an Addendum to the Fishway Design Document that clarifies Trap and Haul design elements and other comments**<br><br>**Questions**<br><br>Is there a trap and haul facility and program that NOAA Fisheries would like to establish as a good working model for the EFSFSR fishway?<br><br>**NOAA Fisheries Response-Green River Trap and Haul** |



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<table>
<tr><th colspan="2">II. Rock weir design and protocols to maintain pool elevation<br>in the adult holding pool and fishway entrance<br>(Design and FOMP)</th></tr>
<tr><th>Comment</th><th>Response</th></tr>
<tr><td rowspan="3">Section 2.2.4.4; Page 2-11<br><br>The rock weir will determine the water elevation at the adult holding pool.<br><br>• It will be important to monitor the fishway entrance conditions because they will dictate the level of the rock weirs.<br>• The drop at the fishway entrance should not exceed 1.5 feet. If greater than 1.5 feet, then rocks in the weir should be adjusted to reduce the drop at the fishway entrance.<br>• Please describe the methods and protocols for monitoring and maintaining the adult holding pool and fishway entrance conditions in Section 3.<br><br>We recommend maintenance occur on the receding limb of the hydrograph.</td><td>Additional text and detail will be included (i.e., fishway inspection) for methods and protocols to maintain the adult holding pool and fishway entrance. (see next slide Rock Weir)<br><br>Thanks for the recommendation on timing of maintenance.</td></tr>
<tr><th>Questions/Discussion</th></tr>
<tr><td>• Discuss additional topics with the Services on the methods and protocols they envision for monitoring the fishway.<br>• Establish a standard operating procedure (SOP) for inspection and maintenance of the North Portal section of the EFSFSR tunnel.<br>• Discuss fishway entrance differentials in relation to the controlling feature of the adult holding pool and stream flow.<br>    • High and low flow conditions and potential backwatering of first weir<br>    • Concrete control structure instead of rock weir<br>• Discuss frequency of physical/remote monitoring inside and outside migration periods.<br>• Discuss reporting format and requirements</td></tr>
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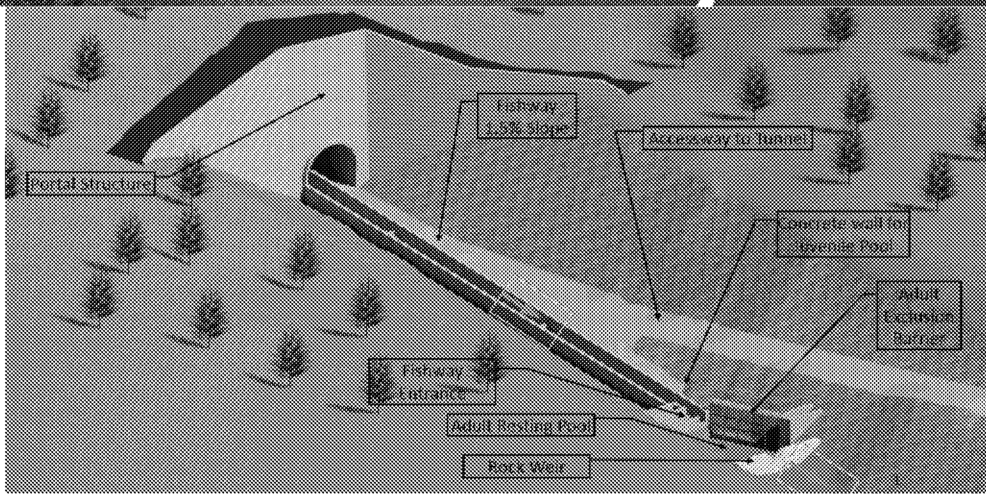
# Review/Address Comments on the FOMP




**Isometric illustration of the north portal section of the EFSFSR tunnel**
*Blue arrows indicate direction of streamflow down the fishway to the rock weir.*

# Review/Address Comments on the FOMP

| III. Management of stream flow during watering and dewatering of tunnel/fishway (FOMP and Diversion and Dewatering and Fish Salvage Plan) | |
|---|---|
| **Comment** | **Response** |
| **Comment: Section 3.13; Page 3-7**<br>**Provide more detail about:**<br>• How will fish passage during the Chinook salmon and bull trout migration/spawning be maintained when the restored stream channel is receiving incremental streamflow prior to full dewatering of the tunnel?<br>• how streamflow will be incrementally increased (e.g., for how long will it occur; what will be the source of water; etc.).<br>• How will fish stranding be avoided? | **Response:**<br>**Provide additional detail in appropriate sections**<br>**Maintaining Adult Fish Passage/Migrations**<br>**Avoidance Measure:** Re-watering of the restored stream channel will be scheduled to occur prior to adult Chinook salmon and bull trout migrations<br>**Minimization Measure:** Water will be introduced incrementally as a fraction of total stream flow to re-water the restored stream channel (HIP III protocol)<br>**Minimize Effects:** Adult fishway will always remain flowing until the fishway is closed or is bypassed for maintenance<br>**Next Slide-** EFSFSR Tunnel Activation Example |

# Review/Address Comments on the FOMP

**Activation of EFSFSR Tunnel Sequence**

- Establish reference conditions (i.e., stream flow and turbidity) upstream from diversion/cofferdam
- Pre-wash the accessway and then the fishway with water diverted from the EFSFSR
- Use screened pump or similarly screened device on cofferdam for water source conveyance
- Detain pre-wash water and extract from north portal adult holding pool
- Discharged water to uplands until turbidity is within 10% of background conditions
- Introduce the first 1/3 of total flow to tunnel over the course of 2-4 hours once acceptable turbidity levels have been established
- Monitor turbidity and introduce second 1/3 of total flow to tunnel over the course of 2-4 hours
- Until 2/3 of total flow has been established and acceptable turbidity have been achieved no fish will be allowed in tunnel
- Fish exclusion devices will be removed at tunnel portals when acceptable passage, flow, and water quality conditions have been achieved
- Conduct fish salvage operation in the EFSFSR channel and YPP
- Introduce the last 1/3 of stream flow to EFSFSR Tunnel
- Once that has been achieved all fish passage will proceed through the EFSFSR Tunnel

**Next slide: Activation of Restored EFSFSR stream channel next slide**

# Review/Address Comments on the FOMP

**Activation of Restored EFSFSR Channel Sequence**

- Pre-wash the restored EFSFSR stream channel before full watering up the natural channel
  - Use screened pump or similarly screened device on cofferdam for water source conveyance to restored channel.
  - Pump water from EFSFSR tunnel to establish flow in restored channel
- Detain pre-wash water and extract by pump from near the downstream end of the restored channel; discharge to upland; stream channel fully saturated
- Introduce the first 1/3 of total flow to natural channel over the course of 2-4 hours once acceptable turbidity levels have been established
- Monitor turbidity and introduce second 1/3 of total flow to restored channel over the course of 2-4 hours
- Until 2/3 of total flow has been established and acceptable turbidity has been achieved no fish will be allowed in the restored EFSFSR channel
- Fish exclusion devices will be removed when acceptable passage, flow, and wq conditions have been achieved in the restored EFSFSR channel
- Salvage fish from the tunnel
- Introduce the last 1/3 of stream flow to restored EFSFSR channel
- Once flow is established in the restored channel it will become the preferred passage route
- During high stream flows the tunnel may be activated, and downstream migrants would pass volitionally through the restored channel and tunnel
  - Reactivation of the tunnel under consideration, but it will very likely be somewhere around a bankfull discharge which is around 215cfs. Q100 is around 635 cfs.
- Adults will be excluded from entering the tunnel. Instead, adults will pass upstream through the restored EFSFSR channel

# Review/Address Comments on the FOMP

| IV. Monitoring and Maintaining Tunnel Elements (FOMP with design input) | |
|---|---|
| **Comment** | **Response** |
| **Comment: Section 3; General**<br>Describe the methods and protocols for monitoring and maintaining each tunnel element identified in Section 2 (including trap and haul facilities). This may include, but is not limited to:<br><br>**Monitoring, metrics and triggers**<br>• what metrics will be monitored;<br>• when monitoring will occur;<br>• what will trigger maintenance; | -Additional text for each tunnel element will be added to the extent that it can be developed.<br><br>**Questions/Discussion**<br><br>**-Discuss Sediment trap example**<br>-Metrics to be monitored: Sediment volume, capacity and accumulation rate. Develop/establish sediment gauge to estimate metrics.<br>-Monitoring frequency: Discuss monitoring schedule with Services that incorporates elements of expected sediment delivery and accumulation.<br>-Identify maintenance trigger(s): Develop an optimal working sediment volume (i.e., reserve capacity) that once exceeded triggers maintenance. |

# Review/Address Comments on the FOMP

| IV. Monitoring and Maintaining Tunnel Elements<br>(FOMP with design input) cont. | |
|---|---|
| **Comment** | **Response** |
| **<u>Comment: Con't</u>**<br>**Fish Isolation, Salvage, Dewatering**<br>• how the action area will be isolated to keep fish out;<br>• how fish will be salvaged if they are present in the action area;<br>• whether and how dewatering will be performed;<br>**Maintenance Methods, Identify Potential Adverse Effects, and BMPs**<br>• methods used to conduct maintenance;<br>• detailed summary of how maintenance will be conducted;<br>• identify what potential adverse effects may occur as a result of operations/maintenance; and,<br>• what BMPs will be implemented to remove or reduce those effects. | -Additional text for each tunnel element will be added to the extent that it can be developed.<br><br>**Questions/Discussion**<br><br>**Develop standard operating procedures (SOPs) for isolation/fish salvage/dewatering in the north portal, south portal, accessway, and fishway.**<br>• Include isolation, fish salvage, fish relocation, dewatering, and re-watering different tunnel elements.<br>• Include SOPs in an appendix<br>• Update individual SOPs as needed<br><br>**Develop SOPs associated with maintenance/repair including fishway inspection.**<br>• Include methods and detailed summary of maintenance<br>• Identify potential adverse effects and BMPs for those effects |

# Review/Address Comments on the FOMP

| V. Management of sediment and accumulation in fishway (Design and FOMP) | |
|---|---|
| **Comment** | **Response** |
| <u>**Comment:**</u> **Section 3.2.1; Page 3-2**<br>**Need more information about how substrate and sediment will be removed from**<br>• The primary sediment trap,<br>• sediment drop out zone, and<br>• fishway.<br><br>**It is preferable to conduct cleaning in the dry to minimize impacts to aquatic habitat (i.e., turbidity) and fish that may be present.**<br>• If this is not feasible, please add more detail regarding how potential impacts to fish (i.e., death or injury) and designated critical habitat (i.e., turbidity) will be minimized.<br>• For example, cleaning with a suction dredge would likely result in lower instream turbidity compared to removing material with an excavator. | Add more detail and develop SOPs in an appendix for procedures to remove sediment from fishway, sediment trap, and drop out zone<br><br>**Questions/Discussion**<br><u>SOP fishway</u><br>• Develop a trigger for sediment removal?<br>• **Avoid effects:** Isolate work area and remove sediment from weirs with <u>no fish presence</u><br>• **Minimize effects:** When fish <u>are present</u>, use crowder or net to move fish upstream/downstream from work area.<br>  • Move juvenile downstream and adults upstream<br>• Isolate work area to prevent fish from moving back and remove sediment<br>• Method: remove sediment with mobile vacuum truck<br><br><u>SOP for sediment trap and drop out zone</u><br>• Use 230 Excavator<br>• Not likely to occur in dry (no dewatering)<br>• Discuss potential avoidance and minimization measures with Services |

# Review/Address Comments on the FOMP

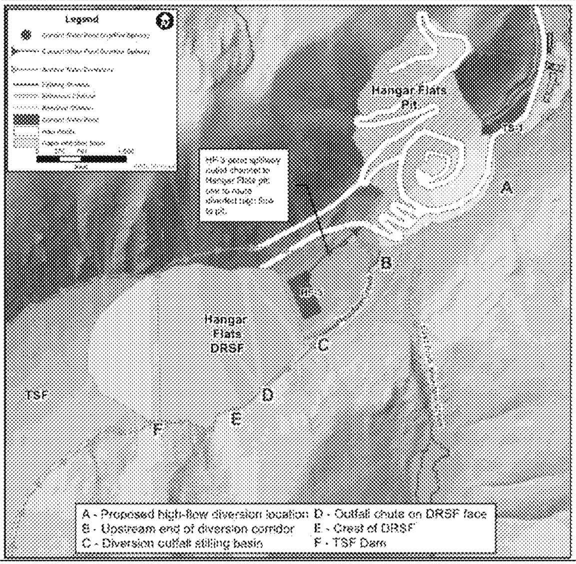
| VI. Frequency of Tunnel Portal Inspection (Design and FOMP) | |
|---|---|
| **Comment** | **Response** |
| **Comment: Section 3.3; Page 3-3**<br>• What is the frequency of tunnel portal inspection?<br>• The document organization creates uncertainty as to whether the inspection frequency described in Section 3.2 remains applicable in Sections 3.3 through 3.10. | **Additional text and inspection frequency to SOPs (Appendices)**<br>• Establish frequency of physical inspection and include remote camera video monitoring capabilities noted in Section 4.2.1 and crossover potential for section 3<br>**Questions/Discussion**<br>**Develop an EFSFSR tunnel inspection frequency for each element and what is included in the inspection. Organized based on:**<br>• Tunnel structural stability, integrity, fish passage design element (Engineer+Biologist)<br>• Routine fishway maintenance and operations, trap and haul equipment, and vehicles (Technician)<br>• Fishway monitoring equipment (Specialist + Biologist) |


Discuss Meadow Creek
Diversion Options

# Discuss Meadow Creek Diversion Options

*Intent: To present potential diversion options and how they may reduce potential impacts .*

# Discuss Meadow Creek Diversion Options




**Proposed Site – East end of HFP below Blowout Creek Confluence**

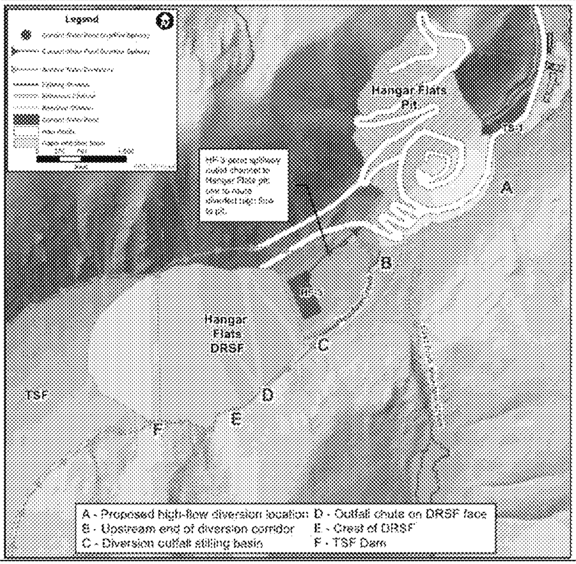
Pro:

- Minimizes length of Meadow Creek affected by diversion of high flows into pit
- Below Blowout Creek thus highest low- and high-flows available, therefore fastest fill time and easier to maintain 5 cfs below it.
- Tied for most direct and shortest route to pit
- Low gradient, subcritical section

Con:

- Fish highly likely present, requiring screening.

# Discuss Meadow Creek Diversion Options




**Alternative – Upstream End of Operational Diversion Corridor**

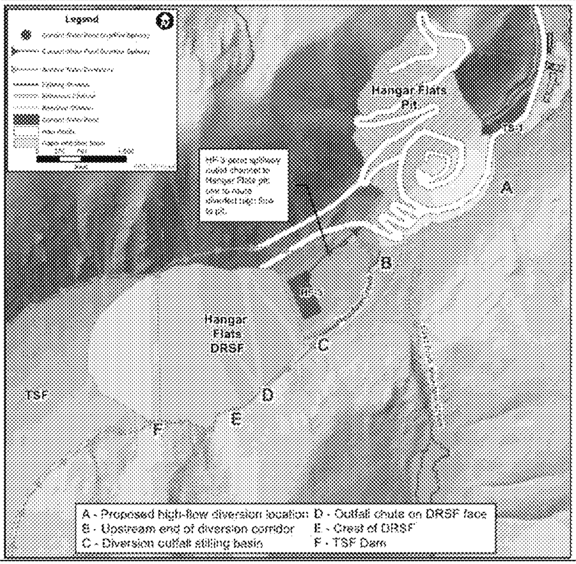
Pro:

- On valley bottom, essentially same overland distance to pit as proposed site.

Con:

- Fish highly likely to be present.
- Over 2,000 LF longer portion of Meadow Creek affected by loss of high flows vs. proposed site.
- Difficult to maintain low flow below point of diversion.
- Slower pit fill time.

# Discuss Meadow Creek Diversion Options




**Alternative – Diversion Outfall Stilling Basin**

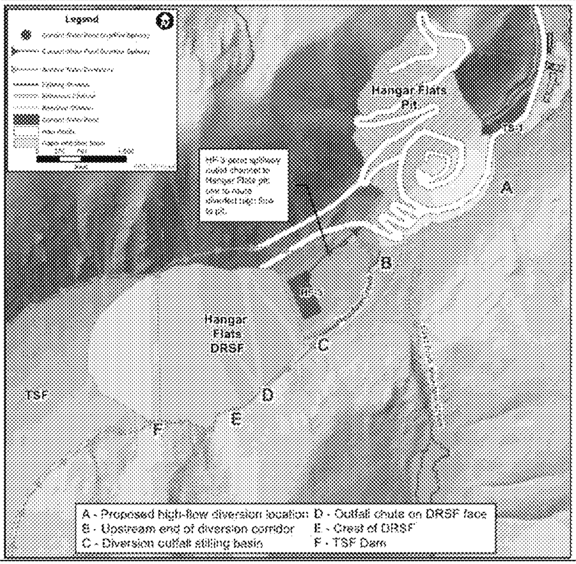
Pro:

- On valley bottom, proximal to pond spillway channel to route to pit.
- Potential to extend low-flow pipe outfalls.

Con:

- Fish may be present depending on effectiveness of exclusion from stilling basin or lined segment below.
- Over 3,000 LF longer portion of Meadow Creek affected by loss of high flows vs. proposed site.
- Difficult to maintain low flow below point of diversion.
- Slower pit fill time.

# Discuss Meadow Creek Diversion Options

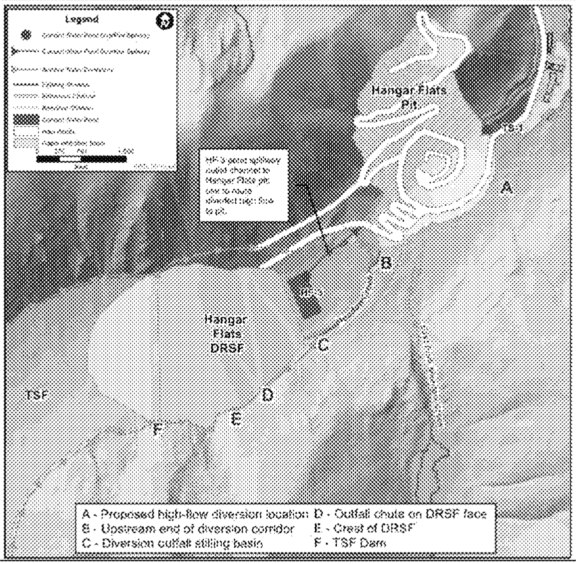



**Alternative– Diversion Outfall Chute at Face of DRSF**

Pro:
- No fish likely
- Approx. 1 cfs of low flow already piped for temperature control; could increase and route away/around

Con:
- 3rd farthest distance in dedicated diversion channel or pipeline
- 3rd longest route to pit
- Supercritical/high-energy section, complicating diversion structure design
- Difficult to maintain low flow below point of diversion.
- Slower pit fill time.

# Discuss Meadow Creek Diversion Options




**Alternative– Crest of Hangar Flats DRSF**

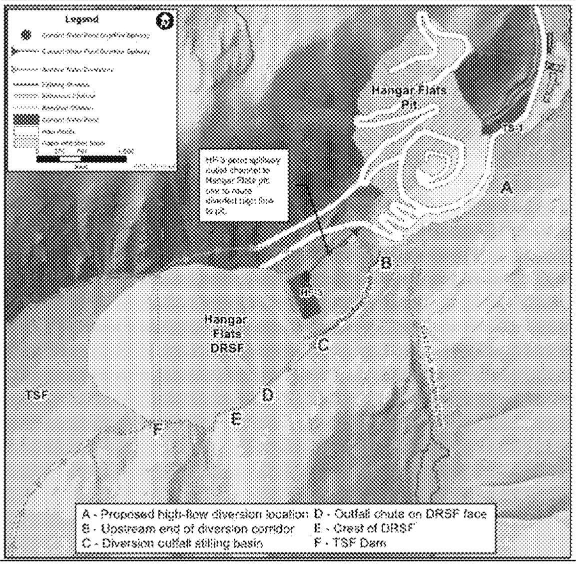
Pro:

- No fish likely
- Approx. 1 cfs of low flow already piped for temperature control; could increase and route away

Con:

- 2nd farthest distance in dedicated diversion channel or pipeline
- 2nd longest route to pit
- Difficult to maintain low flow below point of diversion.
- Slower pit fill time.

# Discuss Meadow Creek Diversion Options




**Alternative – TSF Dam**

Pro:

- No fish likely
- Approx. 1 cfs of low flow already piped for temperature control; could increase and route away

Con:

- Farthest distance in dedicated diversion channel or pipeline
- Longest route to pit
- No apparent advantages Crest of DRSF location
- Above Blowout Creek and lined below, so lower flow than proposed site and therefore more difficult to ensure enough flow remains if diversion rate imprecise, and slower fill time for HFP since less high flow volume available.


Downstream Effects of High
Flow Diversions for Hangar
Flat Pit Refill

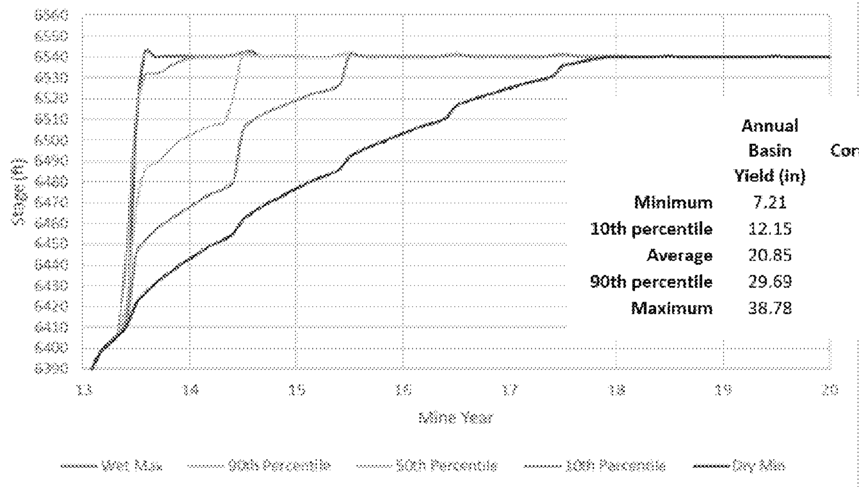
# Downstream Effects of High Flow Diversions for Hangar Flat Pit Refill

*Intent: To provide an overview of downstream effects of flow diversions into the Hangar Flats Pit during filling of the pit.*

# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

- Mod PRO includes partial backfill and diverting MC flows into HF Pit to fill the pit
- Modeling of pit refill presented at ESA IC Fish Meeting in August showed refill would take 1-2 years (except in rare low-runoff years)
- Proposed continuous flow by the Meadow Creek diversion point = 5 cfs

# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit




| | Annual Basin Yield (in) | Corresponding Year | Filling Time |
|---|---|---|---|
| **Minimum** | 7.21 | 1994 | 4 years, 10 months |
| **10th percentile** | 12.15 | 2005 | 2 years, 5 months |
| **Average** | 20.85 | 2013 | 1 years, 5 months |
| **90th percentile** | 29.69 | 1940 | 12 months |
| **Maximum** | 38.78 | 1982 | 6 months |



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# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

## Methods for Simulating Downstream Effects

- Compiled 90-yr monthly time series of streamflow at four (4) stations on MC and EFSFSR (same data as previously presented)
  - Meadow Creek (MC) below East Fork MC
  - EFSFSR below Meadow Cr.
  - EFSFSR above Sugar Cr.
  - EFSFSR below Sugar Cr.
- "No Diversion" time series is the measured baseline
- Used mass-balance (subtracted diversion flow) to create the streamflow time series for PRO to create estimated downstream flows for each station:
  - Diversion above 10 cfs
  - Diversion above 5 cfs

# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

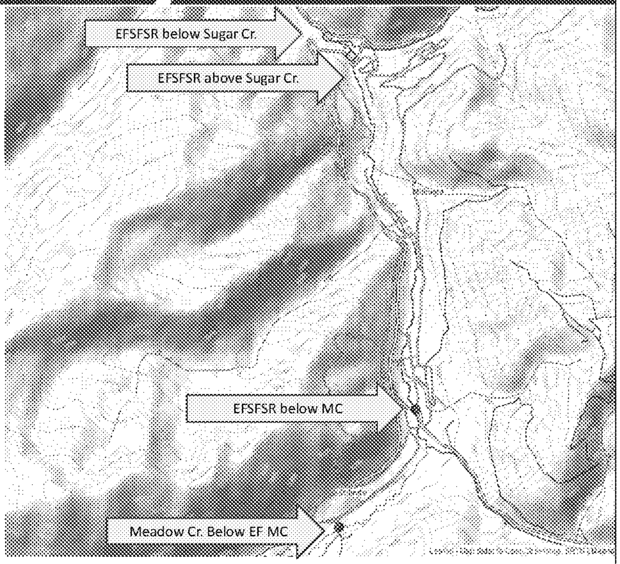
**Methods for Simulating Downstream Effects (cont.)**

- Prepared comparative graphics
- Ran Indicators of Hydrologic Alteration (IHA) program for pair-wise comparative analysis at all four stations
  - No Diversion vs. Diversion >10 cfs
  - No Diversion vs. Diversion >5 cfs
- Summarized results tabular and graphical comparison
- Comparative analysis statistically describes how flow regime or would be changed for the period of refilling

# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

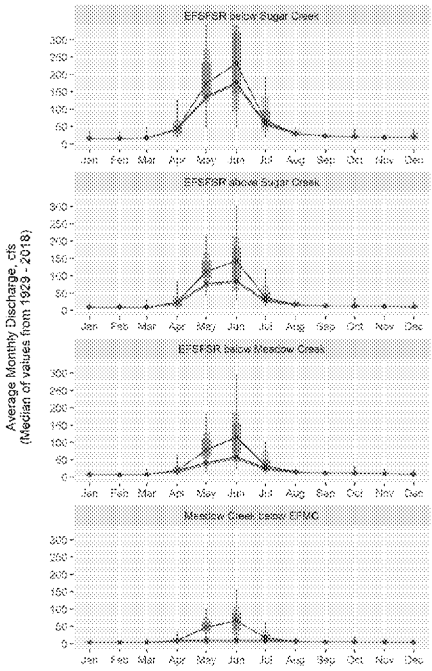
**Four Stations:**

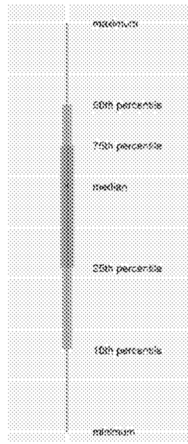
- Meadow Creek (MC) below East Fork MC
- EFSFSR below Meadow Cr.
- EFSFSR above Sugar Cr.
- EFSFSR below Sugar Cr.



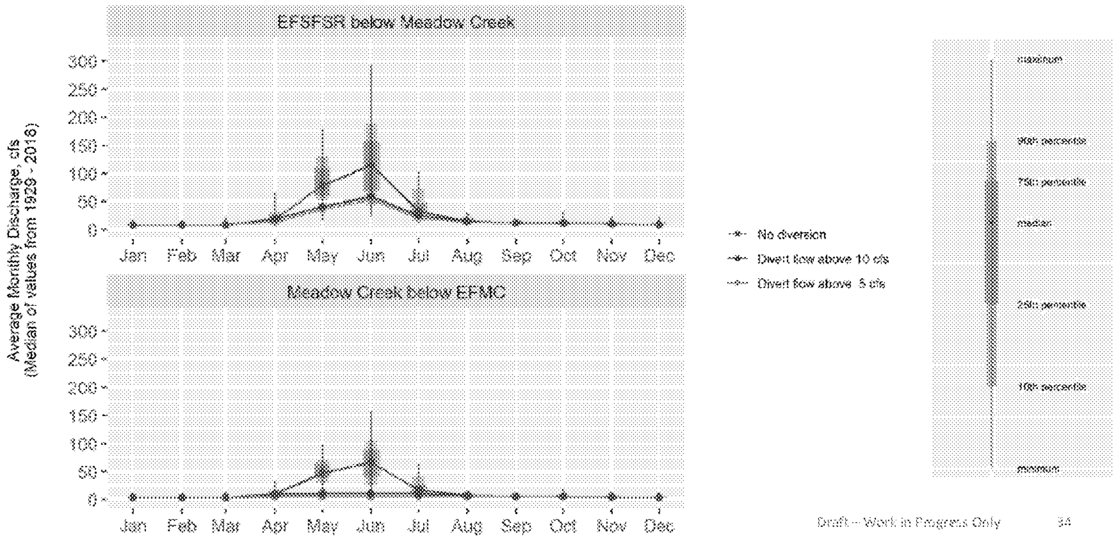
# Results:

Median Monthly Flows and Percentiles at 4 Stations

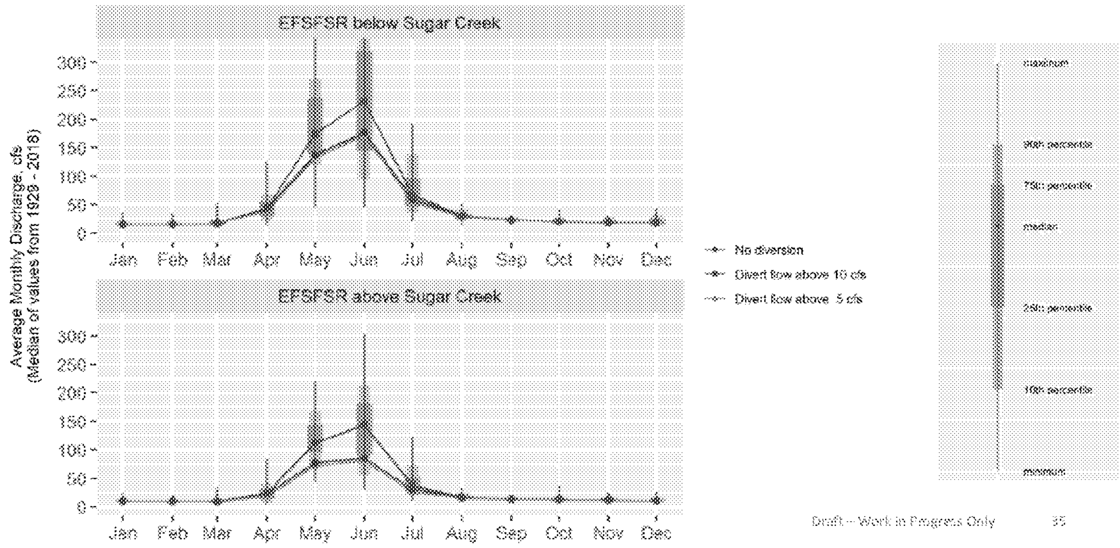


# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit



# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit



# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

**Findings:**

- Effects of diversions limited to higher flows, 1-2 high-flow runoff periods would be affected; low-flow periods largely unaffected
- Monthly flow variability reduced by diversion of flows in upper EFSFSR; reduced to nearly continuous bypass flow rate (5 cfs or 10 cfs)
- Effects on monthly flow variability and higher flows attenuate with increased drainage area
- At EFSFSR above Sugar Cr., monthly high flows are estimated to be similar to high runoff periods in the lower 25$^{th}$ percentile of baseline
- At EFSFSR below Sugar Cr., monthly high flows are estimated to be similar to high runoff periods in the lower 40$^{th}$ percentile of baseline



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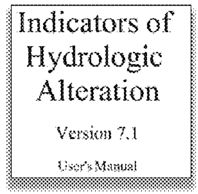
# Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

**Used Indicators of Hydrologic Alteration (IHA) to further confirm using daily streamflow data:**


Indicators of Hydrologic Alteration

Version 7.1

User's Manual

- IHA is widely-used tool to compare baseline and altered flow regime
- Provides "...useful information for those trying to understand the hydrologic impacts of human activities."
- Used by >2,000 water resource managers, agencies, hydrologists, ecologists, and water managers (Nature Conservancy, 2019)
- Comparative analysis of baseline and altered streamflow regimes (time series)
- Assesses 67 ecologically-relevant statistics to characterize effects of water use and management
- Provides median differences and variance of differences in a "scorecard"
- https://www.conservationgateway.org/ConservationPractices/Freshwater/EnvironmentalFlows/MethodsandTools/IndicatorsofHydrologicAlteration/Pages/indicators-hydrologic-alt.aspx

Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

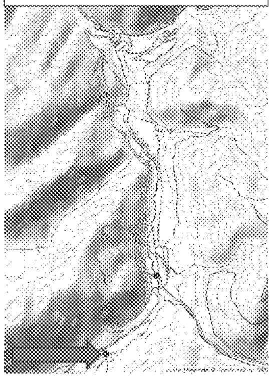
## 33 Indicators of Hydrologic Alteration

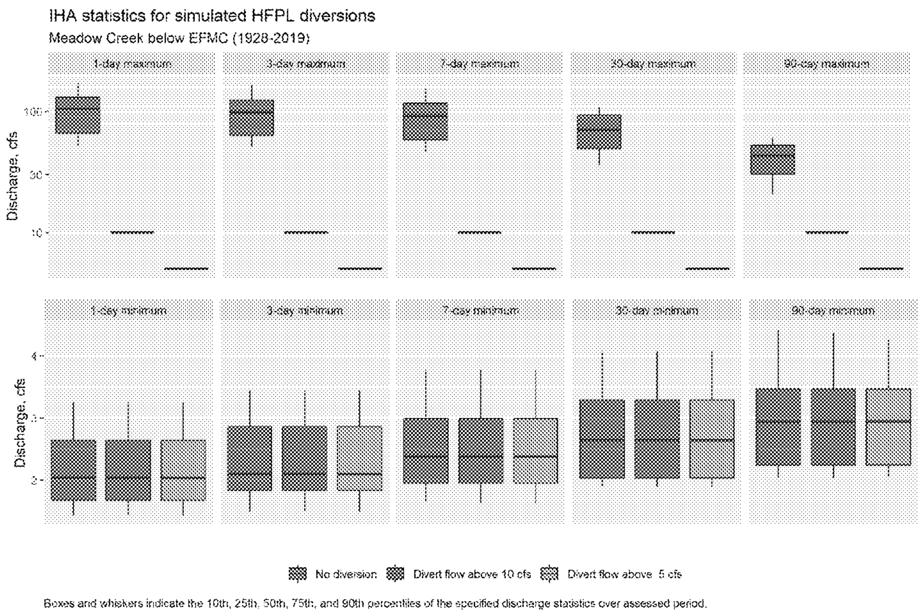
Table. Indicators of Hydrologic Alteration.

| IHA group | Hydrologic parameters |
|---|---|
| Magnitude of monthly water conditions | Mean value for each calendar month (12 parameters) |
| Magnitude and duration of annual extreme water conditions (mean daily flow) | 1. Annual 1-day minima<br>2. Annual 3-day minima<br>3. Annual 7-day minima<br>4. Annual 30-day minima<br>5. Annual 90-day minima<br>6. Annual 1-day maxima<br>7. Annual 3-day maxima<br>8. Annual 7-day maxima<br>9. Annual 30-day maxima<br>10. Annual 90-day maxima<br>11. Number of zero-flow days<br>12. 7-day minima/mean for year |
| Timing of annual extreme water conditions | 1. Julian date of each annual 1-day maxima<br>2. Julian date of each annual 1-day minima |
| Frequency and duration of high and low pulses | 1. Number of low pulses within each year<br>2. Mean duration of low pulses each year<br>3. Number of high pulses within each year<br>4. Mean duration of high pulses each year |
| Rate and frequency of water condition changes | 1. Means of all positive differences between consecutive daily values<br>2. Means of all negative differences between consecutive daily values<br>3. Number of hydrologic reversals |

Maximum and minimum flow statistics for **Meadow Creek below EFMC** for the period **1928-2019.**

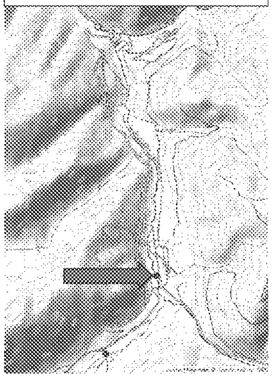
Boxes show the 25th, 50th, and 75th percentiles of the specified statistic over the **37 years**. Whiskers extend from the 10th to 90th percentiles.

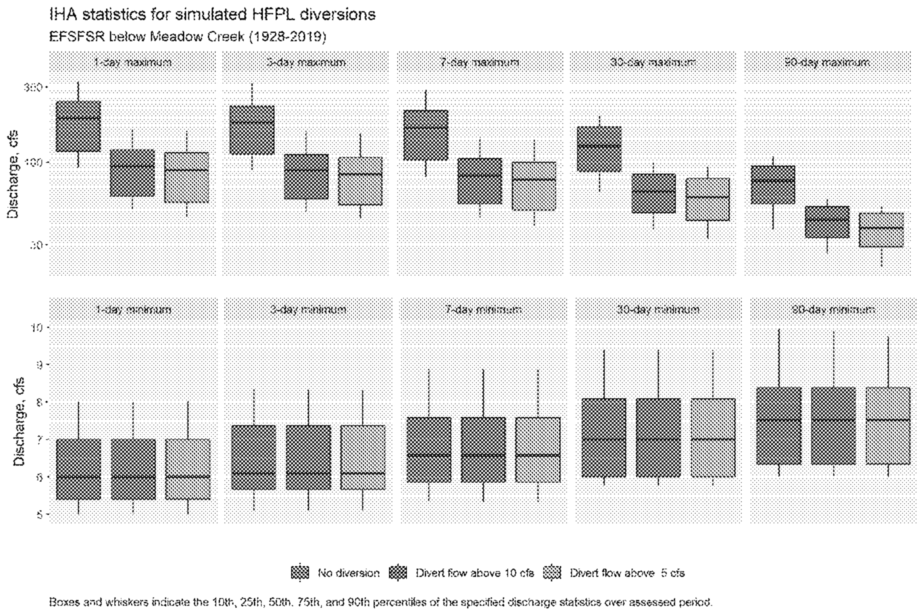




Maximum and minimum flow statistics for EFSFSR below Meadow Creek for the period 1928-2019.

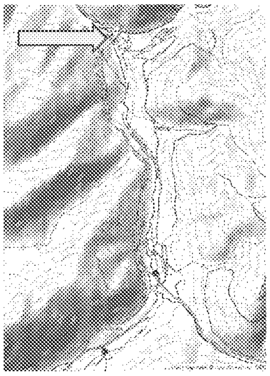
Boxes show the 25th, 50th, and 75th percentiles of the specified statistic over the **37 years**. Whiskers extend from the 10th to 90th percentiles.

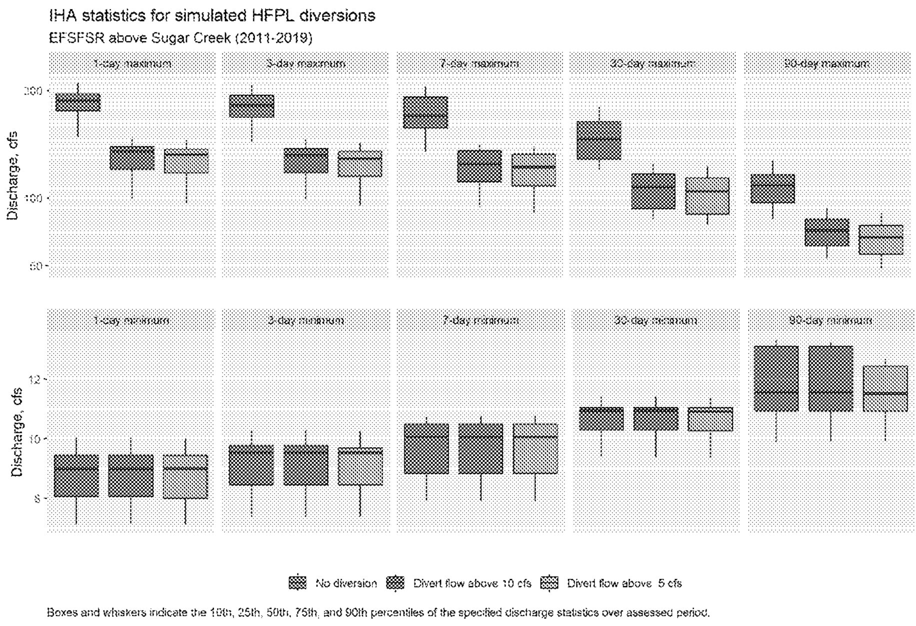




Maximum and minimum flow statistics for **EFSFSR above Sugar Creek** for the period **2011-2019**.

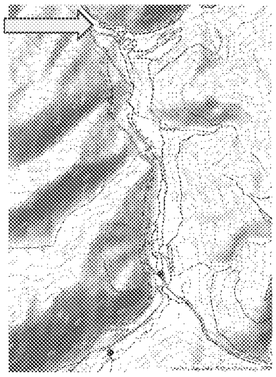
Boxes show the 25th, 50th, and 75th percentiles of the specified statistic over the 37 years. Whiskers extend from the 10th to 90th percentiles. Note that these percentiles are only based on **9 years** of data for this station.

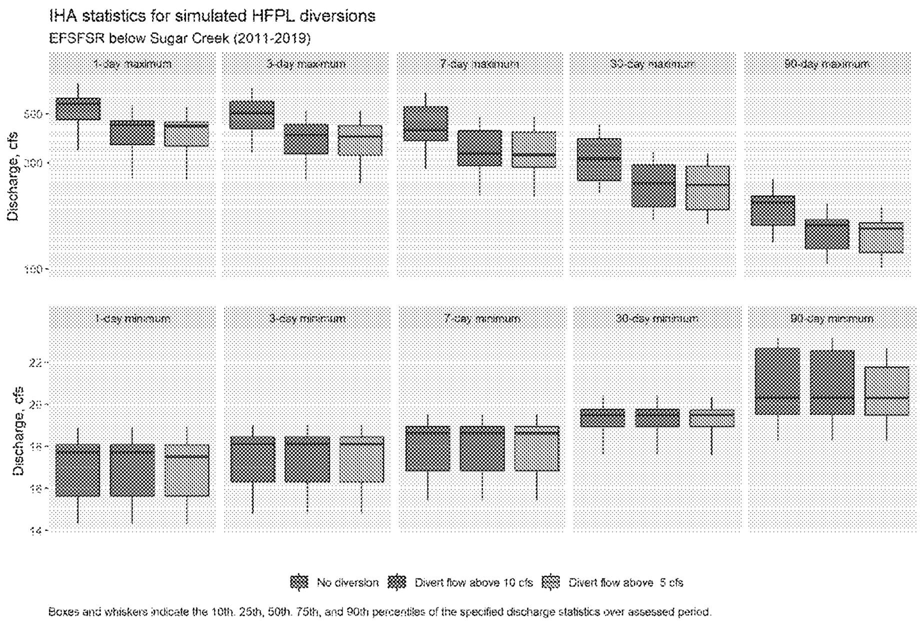




Maximum and minimum flow statistics for **EFSFSR below Sugar Creek** for the period **2011-2019**.

Boxes show the 25th, 50th, and 75th percentiles of the specified statistic over the 37 years. Whiskers extend from the 10th to 90th percentiles. Note that these percentiles are only based on **9 years** of data for this station.





## Downstream Effects of Flow Diversions to Fill Hangar Flats Pit

**Findings from IHA Analysis:**

- Confirms analysis with monthly flows; similar results and conclusions
- Provides greater detail in flow statistics
- Based on shorter periods of record (37 years for upstream two sites and 9 years for downstream two sites)


Fish Salvage Sequencing
Example: Meadow Creek
Salvage at the TSF Area

# Fish Salvage Sequencing Example: Meadow Creek Salvage at the TSF Area

- *Intent: To present a fish salvage sequencing using the Meadow Creek TSF as an example.*

## Fish Salvage Sequencing Example: Meadow Creek Salvage at the TSF Area

- Discuss fish salvage preparation and operations
  - Meadow Creek example for fish salvage
    - Secure necessary permits
    - Develop site layout, planning, coordination, equipment, and timeline
    - Site preparation and BMP development
- Clarifications/Questions from October ESA IC salvage discussion
  - Discuss methods of capture and effectiveness
  - Impacts to species by fish capture method

# Fish Salvage Sequencing Example: Meadow Creek Salvage at the TSF Area

- **Secure State and Federal Permits**
- **Site Layout, Planning, Coordination, Equipment, and Timeline**

# Fish Salvage Sequencing Example: Meadow Creek Salvage at the TSF Area

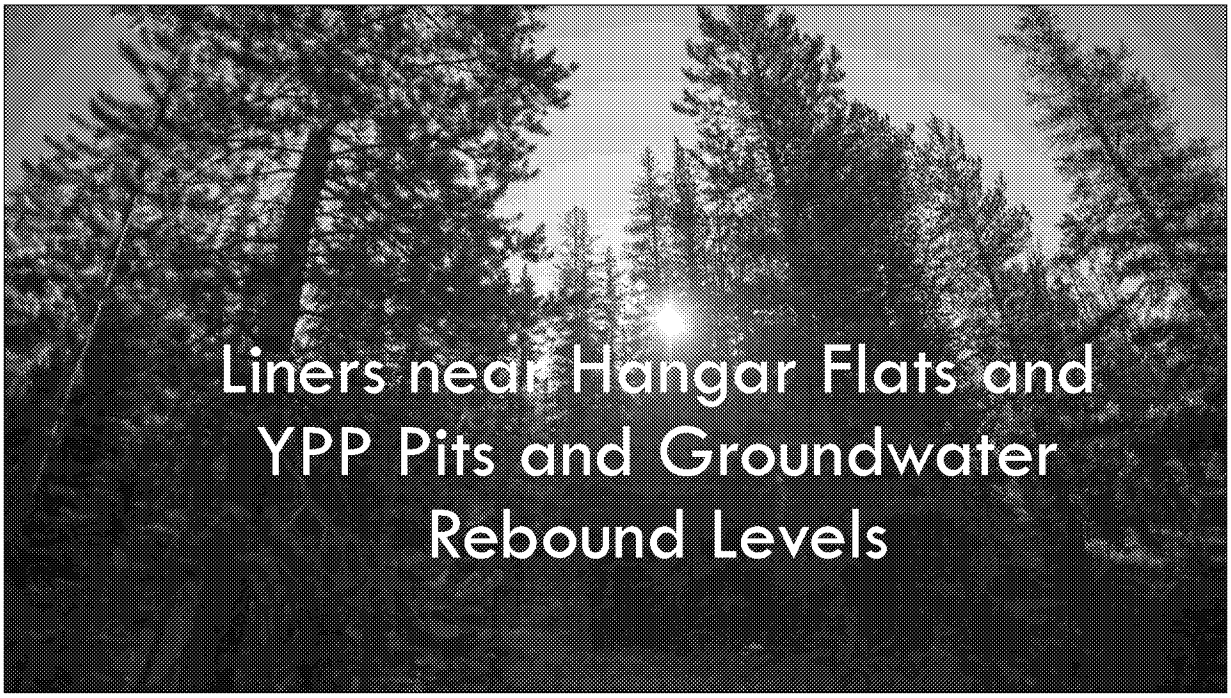
- **Site Preparation and BMP Development**
  - Road Construction and BMPs (erosion control)
    - Prepare roads prior to fish salvage
    - Avoid and minimize sediment generation
    - Road-stream crossings
  - Design and cut hill slopes for canal development and employ BMPs
    - Prepare canals/pipes and point of diversion prior to fish salvage
    - Manage hillslope water drainage to avoid sediment generation
    - Avoid and minimize sediment generation back to natural streams
    - Avoid sensitive areas (i.e., wetland areas? site preparation and planning)

# Fish Salvage Sequencing: Meadow Creek TSF Area Example

- **Site Preparation and BMP Development (cont)**
  - Design and placement of diversions and fish exclusion devices
  - Stage and secure all fish handling/transport equipment onsite for fish salvage event
  - Be prepared to maintain an onsite presence during fish salvage
  - Stage fuel and hazardous materials in a safe and secure location where prevention of hazardous spills and equipment can be controlled
    - Hazardous materials at least 150' from natural water body or wetland
    - Select an area that precludes erosion into or contamination of the stream or floodplain

# Fish Salvage Sequencing Example: Meadow Creek Salvage at the TSF Area

- **Clarifications from October 2019 Fish Salvage discussion**
  - Electrofishing – primary method or use when most effective?
  - Assessing impacts to species by salvage method
  - Plan to use HIPIII protocols as overarching method and provide as appendix


Liners near Hangar Flats and
YPP Pits and Groundwater
Rebound Levels

## Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels

*Intent: To present modeling results of groundwater levels in the vicinity of the lined systems near Hangar Flats and YPP Pits.*

# Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels

- **Agency Concern**
  - Potential loss of streamflow via leaks in proposed liners post mining for long-term and possible need for liner redundancy
  - Risk is potential reduction in streamflow and change in habitat/passage

# Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels

- **Factors to Consider that Mitigate Risk**
  - Up-front planning and stream design features include elements that considerably reduce risk of liner damage
  - Stream channels naturally seal their beds to varying degrees based on the amount fine sediment filling the interstitial spaces between larger grain sizes
  - Groundwater levels near MC and YPP will rebound after mining up to or higher than the bottom of the liners
  - Punctures or splits, should they occur, are unlikely to result in leakage that is a significant portion of typical baseflows

# Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels

- **Stream Design Features**
  - Stream liner transition layers, buffering the stream liner from objects that may puncture or tear the liner
  - Naturally rapid consolidation of development rock backfill, pre-restoration geotechnical monitoring of the backfill, and compaction of final subgrade layer to prevent future differential settlement
  - Within the lined corridor, the exchange of surface water and groundwater exchange can be managed in part by the amount of embeddedness achieved in the stream bed: Greater embeddedness = less porosity = less transmissivity = less groundwater exchange.

# Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels

- **Rebound of Groundwater Levels**
  - Examined simulated recovery of groundwater levels and rates relative to liner elevations, possible leakage rates, and channel and floodplain transmissivity
  - Groundwater levels at MC around HF Pit are simulated to rebound to elevations at or above the liner within 1 to 2 months following the filling of the Hangar Flats pit lake, so liner leaks unlikely to be a long-term concern
  - Groundwater levels at EFSFSR around YPP Pit are simulated to largely return to elevations at or above the liner within a month to year of completion of pit backfilling, so liner leaks unlikely to be a long-term concern for most of the length of the restored stream reach

# Liners near Hangar Flats and YBP Pits and Groundwater Rebound Levels

- **Rates of Leakage Estimated to be Low**
  - Potential leakage rates with liner defect/tear were estimated and are a small portion of total streamflow at low-flow periods, assuming conservative (i.e., more and larger leaks than are likely) estimates of frequencies of punctures/tears.
  - Less than 7% of typical base flows (~0.5 cfs)

# Liners near Hangar Flats and YPP Pits and Groundwater Rebound Levels

- **Findings**
  - Risk of substantial loss of streamflow due to defects/damage to stream channel liners in the long-term is low for both Meadow Cr. around HF Pit and for the EFSFSR around YPP Pit
  - Findings do not support the need for liner redundancy



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Fish Periodicity Continued
Discussion

# Fish Periodicity Continued Discussion

*Intent: To continue discussion of fish periodicity and work window refinements and application.*

# Fish Periodicity Continued Discussion

- Fish vs. non-fish bearing streams
- Development and application of work windows
- Allowance of instream work outside the work windows
- Define activities when work windows apply

# Fish Periodicity Continued Discussion

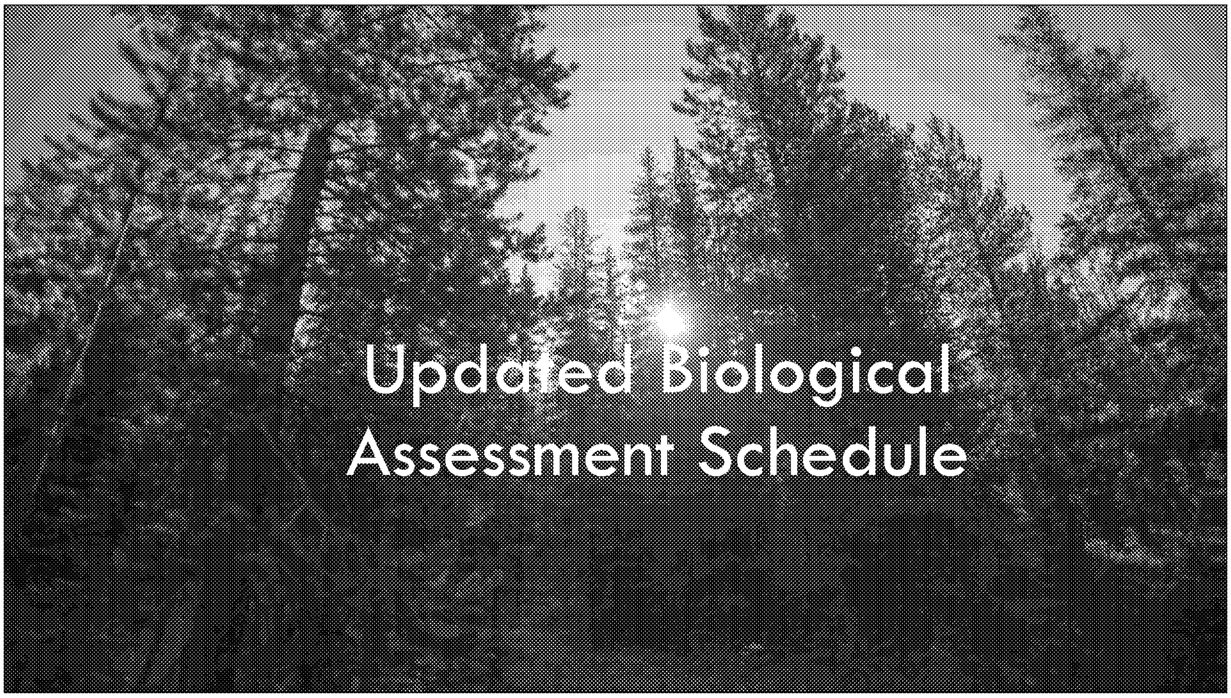
- Non-fish bearing streams
  - No work window needed
  - Develop a map of these areas as part of the development
- Fish bearing streams
  - Base work window on spawning/incubation/emergence period (Completed)
  - Work windows for ground disturbances (i.e., stream restoration and enhancement)
  - Work windows for EFSFSR tunnel (i.e., migration periods)
- Develop work windows for each species (Completed)
  - Work windows for ESA-listed species only? Fiddle Creek and Blow Creek are cutthroat trout only streams. What allowance can be made if the ESA team wants to see work windows for cutthroat trout?
- Application of Work Windows
  - Based on species present
  - Document redd locations in potential disturbance areas
  - Define where and when work windows would be applied
  - Stream restoration and enhancement
  - Fishway (i.e., annual maintenance, substrate cleanout)
  - Work window allowances
  - Identification of redd locations and isolation of areas of concern

# Fish Periodicity Continued Discussion

- An Instream Work Window is the period(s) during the year when work may be carried out with the lowest risk to fish and aquatic habitat, as defined by species life stage periodicities, local knowledge, and knowledge of species and life stage presence in the stream reach of concern (*note we do not say that it is when NO activity is allowed in stream*)
- An Instream Work Window Exception is a variances from the work window activity limitations are relaxed for emergencies or when species presence, surveys, and other information can be used to relax the limitations by showing that a species or incubating embryos are unlikely to be present

# Fish Periodicity Continued Discussion

* In progress – work window slides


Updated Biological
Assessment Schedule

## Updated Biological Assessment Schedule

*Intent: To present an updated schedule.*

## Updated Biological Assessment Schedule

Schedule edits in progress


Future Meeting Objectives
and Draft Agenda

# Future Meeting Objectives and Draft Agenda

*Intent: To define topics for presentation and discussion at the next IC meeting agenda*


Past and New Action Item
Review

# Past and New Action Items Review

*Intent: Review status of agree-upon action items from previous meetings*


Next Meeting and Wrap Up

## Next Meeting and Wrap Up

- Next Meetings – December 5
- Set January Meeting Date


Regulatory Information

# Compliance with NI43-101

The technical information in this presentation (the "Technical Information") has been approved by Stephen P. Quin, P. Geo., President & CEO of Midas Gold Corp. (together with its subsidiaries, "Midas Gold") and a Qualified Person. Midas Gold's exploration activities at Stibnite Gold were carried out under the supervision of Christopher Dail, C.P.G., Qualified Person and Exploration Manager and Richard Moses, C.P.G., Qualified Person and Site Operations Manager. **For readers to fully understand the information in this presentation, they should read the Pre-Feasibility Study Report (available on SEDAR or at www.midasgoldcorp.com) in its entirety (the "Technical Report"), including all qualifications, assumptions and exclusions that relate to the information set out in this presentation that qualifies the Technical Information. The Technical Report is intended to be read as a whole, and sections or summaries should not be read or relied upon out of context. The technical information in the Technical Report is subject to the assumptions and qualifications contained therein.**

**Mineral resources that are not mineral reserves do not have demonstrated economic viability. Mineral resource estimates do not account for mineability, selectivity, mining loss and dilution. These mineral resource estimates include inferred mineral resources that are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves. There is also no certainty that these Inferred mineral resources will be converted to the Measured and Indicated categories through further drilling, or into mineral reserves, once economic considerations are applied.**

Section 2.3 of NI 43-101 states that: Despite paragraph (1) (a), an issuer may disclose in writing the potential quantity and grade, expressed as ranges, of a target for further exploration if the disclosure

(a) states with equal prominence that the potential quantity and grade is conceptual in nature, that there has been insufficient exploration to define a mineral resource and that it is uncertain if further exploration will result in the target being delineated as a mineral resource; and

(b) states the basis on which the disclosed potential quantity and grade has been determined.

The mineral resources and mineral reserves at the Stibnite Gold Project are contained within areas that have seen historical disturbance resulting from prior mining activities. In order for Midas Gold to advance its interests at Stibnite, the Project will be subject to a number of federal, State and local laws and regulations and will require permits to conduct its activities. However, Midas Gold is not aware of any environmental, permitting, legal or other reasons that would prevent it from advancing the project.

The PFS was compiled by M3 Engineering & Technology Corp. ("M3") which was engaged by Midas Gold Corp.'s wholly owned subsidiary, Midas Gold, Inc. ("MGI"), to evaluate potential options for the possible redevelopment of the Stibnite Gold Project based on information available up to the date of the PFS. Givens Pursley LLP (land tenure), Kirkham Geosystems Ltd. (mineral resources), Blue Coast Metallurgy Ltd. (metallurgy), Pieterse Consulting, Inc. (autoclave), Independent Mining Consultants Inc. (mine plan and mineral reserves), Allen R. Anderson Metallurgical Engineer Inc. (recovery methods), HDR Engineering Inc. (access road), SPF Water Engineering, LLC (water rights) and Tierra Group International Ltd. (tailings, water management infrastructure and closure) also contributed to the PFS. Additional details of responsibilities are provided in the technical report filed on SEDAR in December 2014. The PFS supersedes and replaces the technical report entitled 'Preliminary Economic Assessment Technical Report for the Golden Meadows Project, Idaho' prepared by SRK Consulting (Canada) Inc. and dated September 21, 2012 (PEA) and that PEA should no longer be relied upon.

## Non-IFRS Reporting Measures

"Cash Costs", "All-in Sustaining Costs" and "Total costs" are not Performance Measures reported in accordance with International Financial Reporting Standards ("IFRS"). These performance measures are included because these statistics are key performance measures that management uses to monitor performance. Management uses these statistics to assess how the Project ranks against its peer projects and to assess the overall effectiveness and efficiency of the contemplated mining operations. These performance measures do not have a meaning within IFRS and, therefore, amounts presented may not be comparable to similar data presented by other mining companies. These performance measures should not be considered in isolation as a substitute for measures of performance in accordance with IFRS.



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Restore the Site
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WWW.MIDASGOLDIDAHO.COM
EMAIL: info@midasgoldinc.com PHONE: (208) 901-3060